

THE *SHREVEI* GROUP OF HISPANIOLAN *SPHAERODACTYLUS*  
(REPTILIA, GEKKONIDAE)

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## ABSTRACT

The Hispaniolan *shrevei* group of *Sphaerodactylus* is composed of four species, one of which (*S. asterulus*) is described in the present paper. Detailed descriptions of the four included species are presented, as well as a hypothetical history of the group. *S. shrevei* stands alone, whereas the other species show an interrelationship in pattern. The group is considered to be not closely related to other Hispaniolan or Antillean *Sphaerodactylus* and to be north island (*sensu* Williams) in affinities.

On the Antillean island of Hispaniola occurs a group of species of *Sphaerodactylus* without obvious close relatives there or elsewhere in the West Indies. The first-named of this group of lizards is *S. shrevei* Lazell, and the group-name is derived from this species. Two other species have been described: *S. rhabdotus* Schwartz and *S. leucaster* Schwartz. The latter two species were named on limited material; there was only the single female holotype of *S. shrevei*. *Sphaerodactylus rhabdotus* and *S. leucaster* have complementary distributions in the Dominican Valle de Neiba and the contiguous Llanos de Azua to the east, and *S. leucaster* extends northward toward the Valle de San Juan. *Sphaerodactylus shrevei*, on the other hand, was described from the Haitian Presqu'île du Nord Ouest, at Môle St.

Nicholas, removed some 250 km airline from the nearest records for *S. rhabdotus*. We have re-examined the holotype (formerly lost but now found) in light of six new specimens. Small primary series of *S. leucaster* and *S. rhabdotus* have gradually been amplified with additional specimens (rarely series), so that we now know more about the variation in these two species than we did previously.

One problem in obtaining examples of this group of *sphaerodactyls* is that they are xerophiles, inhabiting rigorous and often hazardous terrain -- cactus and *Acacia* forest -- where collecting is difficult. Other than the very large series of the new species described herein, most of which was native-collected, the senior author secured only one specimen from native collectors. The edificarian situations that allowed the collection of the original lots of *S. leucaster* and *S. rhabdotus* no longer exist. Search for these two species of geckos in non-edificarian situations under fallen and decayed arborescent cactus trunks, in decayed *Acacia* trunks, both prostrate and standing, in palm litter, and under rocks, as well as under and in the dead basal rosettes of *Agave* leaves has yielded occasional specimens. This labor has resulted in the accumulation of

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19 specimens of *S. leucaster* and 27 of *S. rhabdotus*. The largest single series of either species is 15 specimens of *S. rhabdotus* from the type-locality, with nine specimens of the same species collected by James R. Dixon near La Descubierta. The series of eight specimens of *S. rhabdotus* from the type-locality is the largest series of that species; all other localities are represented by one or two specimens.

We emphasize the above for a particular reason. In August 1977, we had brought to us, with many specimens of *S. cinereus* Wagler, at Terre Sonnain, north of Les Poteaux, a single specimen of a gecko that obviously belonged to the *shrevei* group. The lizard was in poor condition. It seemed likely that we were at the periphery of its range, since among many lizards, this one specimen was brought to us. Another possibility was that the native collectors there were collecting in a fashion that did not encourage the taking of this type of gecko. Since *S. cinereus* is primarily edificarian or arboreal (under the loose bark of trees), it is conceivable that the local Haitians were concentrating their efforts in such situations and were not looking under ground-cover as a general collecting procedure. On 20 June 1978, we traveled the coastal road between Gonaïves and Coridon for a few kilometers west of Ça Soleil. This trip, west of the Terre Sonnain locality, was an effort to locate more individuals of the same species.

We stopped at an uninhabited locality 9.3 km W Ça Soleil (Fig. 3). The road at this point passes through a series of limestone hills with cliffs, many loose rocks, boulders, and other debris; the most conspicuous plant is *Agave*, of which there were not only large living plants but many decaying basal rosettes of leaves of plants long dead. In addition, there were small piles of rocks scattered over a relatively level area between two hills. Everything

seemed to be appropriate for finding some sort of xerophilic gecko. We had success almost immediately and secured a series of 42 lizards in about 45 minutes by searching in the rock piles and in the *Agave* rosettes; five unhatched eggs (and many empty shells) were also found. The series of lizards agreed with our single specimen from Terre Sonnain from the previous summer. Most amazingly, this species appeared to be locally extremely abundant in contrast to all other members of the group.

As we traveled beyond this locality, we encountered a few roadside huts as well as a small village whose name, after that of this entire region, is Lapierre. Inhabitants of this village were avid collectors and obtained an immense series for us. We later proceeded across the limestone hills to a sea level oasis, where this gecko was also abundant (although it occurred there with two other species, one similar to *S. altavelensis* Noble and Hassler and the other undescribed). We have only one record from farther along (15.7 km W Ça Soleil) the road to Coridon, but we feel certain that its distribution continues still farther along the very xeric and very sparsely inhabited coast. At the town of Coridon, we were unsuccessful in securing specimens but feel that this was due to the abundance there of the much more easily secured *Ameiva chrysolaeama* Cope - the only lizard brought to us by the local inhabitants.

Considering the proximity of the Lapierre area to the type-locality of *S. shrevei* (80 km airline) and its distance from the nearest record of *S. rhabdotus* (130 km airline), we were struck by the similarity in coloration and pattern of these new lizards to *S. rhabdotus* and *S. leucaster*, and not to *S. shrevei*. Basically, *S. shrevei* is blotched, whereas *S. leucaster* and *S. rhabdotus* are longitudinally striped or lined. The new geckos agree with the lat-

ter pair, most especially with *S. leucaster* in that the longitudinal lines are interrupted by tiny white dots. These dots are much smaller than are the similar white blotches or "stars" that interrupt the longitudinal lines in *S. leucaster*. We accumulated a series of 448 specimens of the new species from the Lapierre region. With this huge lot of specimens, as well as the more abundant material of both *S. leucaster* and *S. rhabdotus*, this seems an appropriate time to review this group of xerophilic geckos.

The *shrevei* group may be characterized by the following combination of characters: 1) size moderate; maximum size 31 mm snout-vent length in males, 32 mm in females; 2) dorsal scales large, keeled, subimbricate to not imbricate, and with or without a few scattered middorsal smaller scales forming an incomplete middorsal zone; 3) dorsal scales with dorsal smaller scales forming an incomplete middorsal zone; 3) dorsal scales with hair-bearing scale organs only; 4) throat, chest, and ventral scales smooth; 5) internasal scales usually 2; 6) supralabial scales to mid-eye usually 4; 7) escutcheon extremely variable within species, from 1 to 9 scales in length and from 6 to 25 scales in width, maximally extending to behind the knees laterally; 8) sexual dichromatism weak to absent in basic pattern, but coloration of head different in males and females; 9) dorsal pattern either lineate or blotched, head in males yellow to orange, no dark head pattern present; 10) no scapular patch and included ocelli; 11) ontogenetic variation in dorsal pattern apparently absent; 12) head short and blunt, with a convex snout; 13) pupil of eye vertically elliptical rather than circular.

#### TAXONOMIC ACCOUNTS

*Sphaerodactylus shrevei* Lazell

*Sphaerodactylus shrevei* Lazell, 1961,

Breviora (139):1.

*Type-locality*: Môle St. Nicholas,  
Département du Nord Ouest, Haiti.

*Holotype*: MCZ 62548.

*Definition*. An Hispaniolan species of *Sphaerodactylus* characterized by the combination of: 1) dorsal scales subimbricate or not imbricate, with an ill defined middorsal zone of smaller keeled scales not forming a continuous dorsal row; 2) high number of scales (38-46) around midbody; 3) modally 1 internasal scale; 4) dorsal pattern basically blotched and not lineate, with about 5, more or less symmetrical, pairs of blotches on each side of the dorsal midline (Fig. 2); 5) an irregular ventrolateral line of much smaller blotch-like figures.

*Description*. There are now seven specimens of *S. shrevei*: the holotypic female, three adult females, one subadult male, and 2 juveniles (snout-vent lengths 14 and 17 mm). Scale counts and measurements for the series are: largest male (ASFS V49555) with a snout-vent length of 24 mm, largest females (MCZ 62548, ASFS V49769, ASFS V49831) 30 mm; dorsal scales between axilla and groin 22-27 ( $\bar{x}$  = 23.8); ventral scales between axilla and groin 31-33 (32.2); midbody scales 38-46 (42.0); supralabials to mid-eye modally 4/4 (five individuals) but two individuals have counts of 5/5; internasal modally 1 (5 individuals), but two specimens have 2 internasals; fourth toe lamellae 10-11 (10.3;  $M_0$  = 10 - 75%); escutcheon in single male 6 X 25, consisting of a central group of thickened scales with a single row of scales extending to behind the knee. Lazell's description of the holotype agrees well with the condition in the fresh material. *Sphaerodactylus shrevei* is a blotched (rather than lineate) lizard. There is a broad dark gray cephalic U enclosing a darkly stippled snout, followed by a supraaxillary pair and a postaxillary pair of more or less rectangular

dark blotches; these are in turn followed by about five irregular crossbands that are often broken middorsally to give a series of lateral dark blotches. The ground color is gray dorsally and white ventrally. The two juveniles do not differ markedly from the adults as far as coloration or pattern.

Lazell described the female holotype in life as follows: "a dull-colored animal with a pattern composed of three basic hues — each tending to be unique on an individual scale. There are very irregular dark gray-brown blotches across the dorsum; beginning at the back of the head there are three such markings to the shoulders. There are three more crudely 'Y' shaped markings on the body, the most anterior of which bifurcates to the right, the remaining ones bifurcating to the left. There are two small blotches on the right side of the rump and one on the left. The second transverse blotch, on the nape, is broken by a light middorsal line that continues down through the fourth marking and then fades out. The ground color of the dorsum is ash gray. There are scattered over the dorsal surface short transverse series of white or partly white scales — from two to four in a row — that appear to have no correlation whatever with the rest of the animal's pattern. The top of the head is ash gray except for a very irregular, dark, gray-brown blotch on the parietal area. Coming back from the eye are two stripes, one of which runs downward across the cheek; the other nearly connects with the first transverse marking on the back of the head . . . Along each side of the animal is a line of partially connected, small, dark, gray-brown blotches; just ventral to this row is another composed of widely spaced, single dark, gray-brown scales."

*Distribution:* Known only from the type-locality (Fig. 1).

*Remarks.* *S. shrevei* is so very distinctive in having a blotched pattern that we are not really sure that it is at all closely related to the balance of the species in this group. Although, as will be shown later, some *S. leucaster* approach blotching to some extent, they do not have such a markedly blotched pattern as does *S. shrevei*. Comparisons with other taxa will be made in their appropriate places in the present paper.

Lazell (1961) stated that the holotype was taken from a large circular rock pile, the rocks varying in size from golf ball to nearly football size. The pile was of some age since several *Acacia* were growing from within it. The area at Môle St. Nicholas is arid. The new material was native-collected and we have no data on the habitat.

*Specimen examined.* Haiti, Dept. du Nord Ouest, Môle St. Nicholas (MCZ 62548 — holotype; ASFS V49555-56, ASFS V49586-87, ASFS V49769, ASFS V49831).

*Sphaerodactylus rhabdotus* Schwartz  
*Sphaerodactylus rhabdotus* Schwartz, 1970, J. Herpetology, 4(1-2):64.  
*Type-locality:* 5 km SE La Florida, 500 feet (153 m), Independencia Province, República Dominicana. *Holotype:* USNM 166960.

*Definition.* An Hispaniolan species of *Sphaerodactylus* characterized by the combination of: 1) dorsal scales keeled and only slightly imbricate, a few small keeled scales in the shoulder region but no middorsal row of granules or small scales; 2) moderate number (36-44) of scales at midbody; 3) modally 2 internasal scales; 4) dorsal pattern of two dark brown lines on a pale ground, these lines not interrupted by white dots or spots; a brownish occipital Y usually present (Fig. 2).

**Distribution.** República Dominicana, Independencia Province, from near Las Lajas on the Dominico-Haitian border, east to the vicinity of Angostura, and occurring on both the north and south sides of Lago Enriquillo (Fig. 1).

**Variation.** There are 27 specimens of *S. rhabdotus*; the largest male (USNM 166960 – holotype) has a snout-vent length of 31 mm, the largest female (ASFS V20486) 32 mm. Scale counts on the series are: dorsal scales between axilla and groin 20-28 ( $\bar{x}$  = 23.8); ventral scales between axilla and groin 24-31 (28.0); midbody scales 36-44 (40.4); supralabials to mid-eye modally 4/4 (23 individuals) but other counts of 4/5 (2), 4/6 (1), and 5/5 (1); internasals modally 2 (17 individuals), but other counts of 1 (2) or 3 (8); fourth toe lamellae 9-12 (10.1;  $M_O$  = 9 – 36%); escutcheon 5-9 X 7-25. In life, the dorsal ground color varies from pink (almost lavender) to very pale gray; the dorsolateral lines are brown to black,

these lines usually entire and without interruption (but see beyond). An occipital Y is present but variable in expression (i.e., from clear and distinct to somewhat blurred); the stem of the Y may lead to a median dorsal brown line so that the dorsum appears trilineate. Males have the head and snout yellow in life, and adults of both sexes have the tail yellow; this latter feature is more pronounced in males than in females. The iris has been recorded as brown with a golden pupillary ring, or gray. There may be a few irregularly placed middorsal small, non-granular scales, especially in the shoulder region at the zone of transition from the granular nuchal scales and the large dorsals.

**Comparisons.** As far as size and scutellation are concerned, the differences between *S. shrevei* and *S. rhabdotus* are slight. Females reach about the same snout-vent lengths (30 mm in *S. shrevei*, 32 mm in *S. rhabdotus*). Means of dorsals in axilla-groin distance are the same (23.8). However, *S. shrevei* averages higher in number of ventrals (32.2 versus 28.0) and midbody scales (42.0 versus 40.4). In the latter count, the scale counts of the two species overlap broadly, whereas in the former the counts overlap but slightly (31 – 33 in *S. shrevei*, 24 – 31 in *S. rhabdotus*). The single internasal in *S. shrevei* differs from the 2 internasals in *S. rhabdotus*; the modes in each case are strong. But the two species differ amply in dorsal pattern and coloration; *S. shrevei* is a blotched lizard and lacks an occipital Y, whereas *S. rhabdotus* is lineate and has an occipital Y. The hues involved in both cases are distinctive. *S. rhabdotus* is a pallid lizard, dorsally striped with brown on a pale pink to lavender ground, in contrast to the gray dorsal color and blotched pattern of *S. shrevei*.

The dorsal pattern of *S. rhabdotus* is quite constant. But there is one specimen

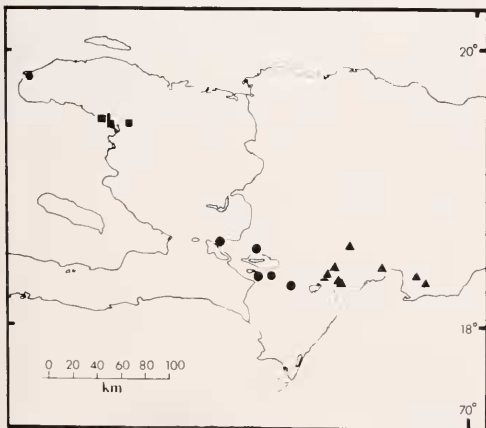


Fig. 1. Hispaniola, eastern Haiti and western República Dominicana, showing the known distributions of *Sphaerodactylus* of the *shrevei* group: hexagon, *S. shrevei*; squares, *S. asterulus*; circles, *S. rhabdotus*; triangles, *S. leucaster*. Some localities for *S. asterulus* have been omitted for clarity.

(TCWC) that requires comment. This individual (male, snout-vent length 26 mm) has the dorsolateral brown lines so broken as to cause them to form a series of dots. Although not all specimens of *S. rhabdotus* have the lines absolutely complete, this individual is at the extreme condition. Faded specimens of *S. leucaster*, which has the dorsolateral lines interrupted by (in life) white, starlike blotches, assume this same pattern (i.e., the white pigmentation fades leaving only broken dark lines). This specimen (TCWC 50162) thus superficially resembles preserved specimens of *S. leucaster*; whether in life it had white spots in the breaks in the dorsolateral stripes is unknown. If so, it would certainly re-enforce the relationship of *S. rhabdotus* and geographically close *S. leucaster* and would suggest that these two species are in actuality subspecies. At present their ranges are known to be complementary, but they differ in dorsal pattern. Perhaps these differences are at the subspecific level, but we are unwilling as yet to take that taxonomic step.

The type series was collected in the fallen thatch of a construction-crew shack at the northern base of the Sierra de Batoruco. The lizards were relatively abundant in the thatch, especially at the interface between the thatch and the limestone base upon which it was resting, and within the dry, folded, accordion-like bases of the palm fronds. The specimen from near Angostura was taken from beneath a piece of dry palm siding at an old and abandoned shack near a gypsum mine. The Duvergé lizard was found in an old pile of palm trunk cuttings in xeric scrub. The senior author has never collected *S. rhabdotus* in a "natural" situation, despite search for it in the xeric Valle de Neiba.

*Specimens examined.* República Dominicana, Independencia Province, 1

km ESE Las Lajas, 75 m (UF/FSM 42920); 5 km SE La Florida, 153 m (USNM 166960 — holotype, USNM 166961-62, CM 45890-92, MCZ 92096-98, ASFS V17180, ASFS V20485-87, ASFS V20797-98); 6 km NW Duvergé (RT 4421); 2.0 km E La Descubierta, 15 m (TCWC 50161-69); 11 km SE Angostura (ASFS V41298).

*Sphaerodactylus leucaster* Schwartz  
*Sphaerodactylus leucaster* Schwartz,

1973, Proc. Biol. Soc. Washington, 86 (4):36. *Type-locality:* El Iguito, 1.6 mi. (2.6 km) NE Fondo Negro, Barahona Province, República Dominicana. *Holotype:* USNM 189234.

*Definition.* An Hispaniolan species of *Sphaerodactylus* characterized by the combination of: 1) dorsal scales keeled and slightly imbricate, with a few smaller scaled middorsally; 2) moderate number (35-46) of scales at midbody; 3) modally 2 internasal scales; 4) dorsal pattern of 2 dark brown dorsolateral and 2 broken ventrolateral stripes on a lavender ground, the dorsolateral stripes with from 4 to 7, relatively large, discrete white spots per stripe; 5) males with a median dark brown nuchal line, females with a dark brown cephalic-nuchal Y (Fig. 2); heads and throats bright orange and tails yellow in males.

*Distribution.* República Dominicana, the extreme eastern portion of the Valle de Neiba, extending thence eastward as far as the vicinity of Bani, Peravia Province, in the Llanos de Azuá (Fig. 1).

*Variation.* There are 19 specimens of *S. leucaster*; the largest male (ASFS V40797) has a snout-vent length of 27 mm, the largest female (ASFS V35639) 31 mm. Scale counts on the series are: dorsals between axilla and groin 19-29 ( $\bar{x}$  = 23.5); ventral scales between axilla and groin 20-32 (27.4); midbody scales 35-46 (39.8); supralabials to mid-eye 4/4 (15

individuals), 3/3 (2), and 5/5 (2); internasals modally 2 (13 individuals) or 1 (6); fourth toe lamellae 7-11 (9.5;  $M_O = 10 - 44\%$ ); escutcheon 5-8 X 8-24. The dorsal color in life is lavender, with, in males, the head bright orange; there is a pair of dorsolateral dark brown lines that begin behind the eyes and extend onto the base of the tail. Ventral to these, there is a pair of lateral dark brown lines. The dorsolateral lines in life are broken by a series of distinct white blotches; in preserved specimens these white blotches disappear (due in part at least to the general pale dorsal color) with the result that the dorsolateral lines appear merely broken. The venter is flesh-colored, and the tail yellow in males. Some specimens have a vague median nuchal line which may lead to a pair of arms extending onto the head, to form an occipital Y. Females are patterned like males except that the head is not orange, and there may be some dark brown stippling on the throat. There are a few scattered smaller scales middorsally.

*Comparisons.* *S. leucaster* most closely resembles *S. rhabdotus* in both coloration and lineate pattern. The major pattern difference between these two species is the presence of the white spots in the dorsolateral lines of *S. leucaster* to give a broken effect. From *S. shrevei*, *S. leucaster* differs in being lineate and not blotched (but see below). Scale counts between *S. leucaster* and *S. rhabdotus* are comparable. *S. shrevei* lies at the upper extreme of *S. leucaster* in midbody scale counts, and the mode in *S. shrevei* is one internasal (71%) a condition observed in about one-third of the *S. leucaster* examined. The iris in *S. leucaster* is greenish gold, and brown to gray in *S. rhabdotus*; there are no data on the iris color in *S. shrevei*.

*Remarks.* We have already commented on the possibility that *S. rhabdotus* and *S. leucaster* should be regarded as subs-

pecies. The two closest localities for the species are 11 km SE Angostura, Independencia Province, and 2 km NE Canoa, Barahona Province — a distance of 21 km. The presence of a single specimen of *S. rhabdotus* from near La Descubierta having a pattern similar to that of *S. leucaster* suggests that there is genetic continuity between the two taxa. But this is slim evidence at best, and neither species is represented from many localities or in series.

Perhaps the most interesting phenomenon in *S. leucaster* occurs in three specimens from the eastern and northern extremes of the range. Four specimens require comment.

ASFS V35790 was brought to the senior author with a long series of *S. ocoa* Schwartz and Thomas, from north of Cruce de Ocoa. It was not noted as being different in coloration or pattern from that species at the time of its acquisition, and thus no color notes were made on it in life. Only under the microscope was it obvious that this individual was a *shrevei* group member (and at that time the easternmost specimen). It differs from other *S. leucaster* in lacking dorsolateral lines and white spots; rather, the dorsum is dotted with dark brown on a brown ground. It is an adult female with a snout-vent length of 29 mm.

A second noteworthy specimen is UF/FSM 36964, a female with a snout-vent length of 26 mm. This specimen is from near Cortés in Azua Province, and thus from the northeastern extreme of the range. It is like the specimen described above, although there are distinct remnants (much broken) of four dorsal lines with some white flecking still distinct on the head (but not the body).

UF/FSM 42926 is a female with a snout-vent length of 28 mm. This specimen is from 2 km NE Baní, the extreme eastern limit of *S. leucaster*. The dorsal

pattern is without any obvious lineate configuration but is rather blotched with large dark blotches, very similar to the condition in *S. shrevei*. Color notes by Fred G. Thompson state that in life the ground color was light grayish blue, head and tail orange, venter more gray than blue, and diffuse black spots on the dorsum. All three of these specimens mentioned lack a nuchal Y.

A fourth specimen is less peculiar; it is ASFS V35638, a male with a snout-vent length of 26 mm, from the type-locality. In this individual, the dorsolateral lines are very broad and broken into a series of dark blotches. The occipital Y is present. The lizard is distinctive only in the width of the dorsolateral lines and the approach to a blotched condition, although the blotching is much less obvious than in UF/FSM 42926.

The significance of these peculiar variants is prolemaical. In each case except the last, there is only one specimen from a locality. Whether there are other species (or subspecies of *S. leucaster*) in the eastern portion of the area we attribute to *S. leucaster* remains undetermined. Yet from, or between, some of these localities, there are specimens that are typical *S. leucaster*. None of the prolemaical specimens is maximally sized. The senior author has tried repeatedly to secure additional specimens at the locality for ASFS V35790 (3 km N Cruce de Ocoa, Peravia Province), without success. In fact, the area is oasis-like in an otherwise very xeric region, not the typical situation for a member of the *shrevei* group. More likely, the local *S. leucaster* population occurs in the adjacent desert areas, where it may be difficult to secure additional specimens.

Aside from the highly specialized situation at the type-locality, *S. leucaster* has been taken in an abandoned termitarium and under the bark of a large, standing,

old *Acacia* near the base, both in xeric coastal woods, and under limestone boulders on a xeric hillside. Fred G. Thompson secured specimens in the dead basal rosettes of *Agave*.

*Specimens examined.* República Dominicana, Barahona Province, 2 km NE Canoa, 50 m (UF/FSM 42924); 3 km NE Canoa, 110 m (UF/FSM 42921); 13 km ESE Canoa (UF/FSM 42922-23); 15 km ESE Canoa (ASFS V40797-98); El Iguito, 2.6 km NE Fondo Negro (USNM 189234 – holotype, ASFS V30524-26, ASFS V35637-40); Azua Province, 2 km NW Cortés, 240 m (UF/FSM 36964); 3.5 km SSE Azua, 30 m (UF/FSM 42925); 5.3 km ESE Azua (USNM 197338); Peravia Province, 3 km N Cruce de Ocoa, 153 m (ASFS V35790); 2 km NE Bani, 100 m (UF/FSM 42926).

*Sphaerodactylus asterulus*, new species

*Holotype.* CM 60521, an adult female, from 9.3 km W Ça Soleil, 92 m, Département de l'Artibonite, Haiti, one of a series collected 20 June 1978 by Eugene D. Graham, Jr., and Albert Schwartz. Original number ASFS V45996.

*Paratypes* (all from Dépt. de l'Artibonite, Haiti). ASFS V45971-95, ASFS V45997-6012, same data as holotype; ASFS V45935, Terre Sonnain, 1.6 km N Les Poteaux, 122 m, 7 August 1977, native collector; ASFS V46015, 7.7 km W Ça Soleil, 30 m, 20 June 1978, E.D. Graham, Jr.; ASFS V46338-49, Lapierre, 7.6 km W Ça Soleil, 122 m, 9 July 1978, native collectors; ASFS V46503-12, Lapierre, 7.6 km W Ça Soleil, 122 m, 10 July 1978, native collectors; ASFS V46588-91, 5.6 km W Ça Soleil, 11 July 1978, native collectors; ASFS V46603-13, 15.9 km W Ça Soleil, 11 July 1978, native collector; ASFS V46615-19, 9.3 km W Ça Soleil, 11 July 1978, native collectors; ASFS V46691-93, 12.2 km W Ça Soleil, 12 July 1978, native collectors; ASFS V46768-93,



12.2 km W Ça Soleil, 14 July 1978, native collectors; ASFS V46594, ASFS V48012-119, Lapierre, 7.6 km W Ça Soleil, 122 m, 11 July 1978, ASFS V46697. ASFS V48200-10, ASFS V48221-97, RT 5618-63, AMNH 115517-31, ANSP 27170-79, CM 60522-36, KU 93393-402, MCZ 132392-400, UF/FSM 21587-600, USNM 197339-55, Lapierre, 7.6 km W Ça Soleil, 122 m, 12 July 1978, native collectors.

*Definition.* An Hispaniolan species of *Sphaerodactylus* characterized by the combination of: 1) dorsal scales keeled and slightly imbricate, without a middorsal row of small scales; 2) low number (33-42) of scales at midbody; 3) modally 2 internasal scales; 4) dorsal pattern of two dark brown dorsolateral and two dark brown lateral lines on a purplish tan ground color, the dorsolateral lines with a series of tiny white dots, each encompassing a granule (on the neck) or a portion of a dorsal scale (on the body), these white dots numbering as many as 12 on each side; 5) a dark brown nuchal Y, which may disappear or become more diffuse with increasing size or darker ground color, the Y most often repre-

sented only by its stem in males, complete in females (Fig. 2); 6) heads yellowish to yellow in males, only faintly yellowish in females, throat and tails bright yellow in males; 7) often with some sort of stippled, lineate or reticulate dark throat pattern in both sexes; more pronounced and frequent in males.

*Description of holotype.* An adult female with a snout-vent length of 30 mm and a tail length (distal three-quarters regenerated) of 22 m. Scale counts are: dorsals between axilla and groin 31, ventrals between axilla and groin 31, scales around midbody 40, fourth toe lamellae 12, supralabials to mid-eye 4/4, 2 internasals. Dorsal scales subimbricate to not imbricate, keeled; ventral scales smooth, imbricate, cycloid. Dorsum in life pale tan to purplish tan with a pair of dark brown dorsolateral stripes from level of the upper margin, of the eye onto the unregenerated base of the tail, a pair of similarly colored lateral stripes from about the level of the upper lip posteriorly above the forelimb insertion to above the hindlimb insertion, much less clear on the base of the tail, and the vague

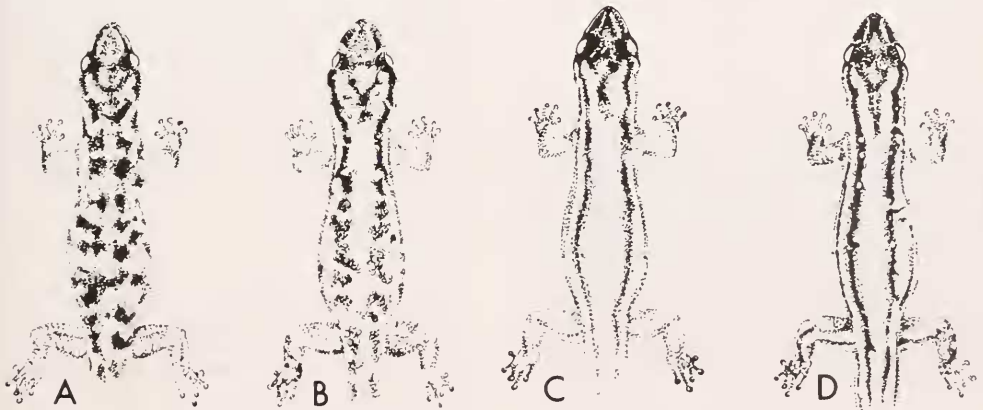


Fig. 1. Hispaniola, eastern Haiti and western Republica Dominicana, showing the known distributions of *Sphaerodactylus* of the *shrevei* group: hexagon, *S. shrevei*; squares, *S. asterulus*; circles, *S. rhabdotus*; triangles, *S. leucaster*. Some localities for *S. asterulus* have been omitted for clarity.

remnants of a third pair of lines low on the sides separating the dorsal tan ground color from the grayish flesh-colored venter; a nuchal Y present but very diffuse, the stem abbreviated; a series of white dots in the dorsolateral lines beginning on the postocular granules (where each spot is restricted to a granule) and proceeding posteriorly, about 6 dots on each side; fore- and hindlimbs mottled with shades of brown to tan; head faintly yellowish and without distinct pattern except for dark lores and dark upper surface.

*Variation.* Of the series of 448 *S. asterulus*, the complete suite of counts has been taken on 63 specimens; counts of supralabials and internasals, and snout-vent length measurements only were taken on the remaining specimens. The largest male (RT 5628) has a snout-vent length of 31 mm, the largest females (ASFS V46776, ASFS V48123) 31 mm. Scale counts are: dorsals axilla to groin 17-24 ( $\bar{x}$  = 21.4); ventrals axilla to groin 25-33 (28.6); midbody scales 33-42 (37.2); supralabials to mid-eye 4/4 (414 individuals), 3/3 (2), 3/4 (2), 4/5 (25), 5/5 (3); internasals 2 (266 individuals), 1 (50), 3 (107), 4 (2); fourth toe lamellae 8-12 (10.2;  $M_0$  = 10 - 37%); escutcheon 1-9 X 6-21.



Fig. 3. The type-locality of *S. asterulus* (9.3 km W Ça Soleil, Dept. de l'Arbonite, Haiti); from a Kodachrome slide taken by Eugene D. Graham, Jr., 14 July 1978.

In such a long series, including large numbers of males, females, subadults, and juveniles, it is not surprising that there is great variation in dorsal color and pattern. As a general statement, males are pale purplish tan dorsally, with 2 dark brown dorsolateral lines and a pair of lateral brown lines, to give a generally tetralineate effect; in addition to these lines, there is a ventrolateral pair, that are diffuse or broken, at the junction of the dorsal and ventral colors; the dorsolateral lines have as many as 12 tiny white dots enclosed within them, these dots encompassing a single granule on the neck region (where there may be 3 or 4 white dots crowded together) and only a portion of a dorsal scale on the body. These white dots are tiny but nevertheless quite conspicuous in life against the brown stripe. The cephalic Y is present but in males may be reduced to only its stem as a short middorsal nuchal dark brown line. The heads of males are yellow to yellowish, and the throats are bright yellow as are the tails. The venter is grayish flesh-colored, in sharp contrast to the yellow throat.

Females are basically like the males in dorsal pattern but usually with a complete cephalic Y; the heads are at times only faintly yellowish. The general female dorsal aspect is paler than that of males, more contrastingly lined, and the dorsal ground color tends towards tans without purplish tints. The iris in both sexes is yellow.

Juveniles are patterned like females, but the ground color is paler, and the lines are all more distinct. In juvenile specimens the ventrolateral pair of lines may be as distinct and entire as the dorsolateral and lateral lines, or they may be fragmented and incomplete as described for the holotype.

The dorsolateral lines are common to most of the series. In some females, the

contrast between the lines and the ground color is not so intense as in other females, and the occipital Y is either incomplete (represented by its stem only) or diffuse and almost concolor with the dorsal cephalic brownish color. Throats in both sexes may be immaculate. This is the common condition in males, whereas in many (but not all) females there may be vague indications of a grayish reticulum or grayish stippling on the throat. In subadult females the dark loreal line and a dark median snout line are present, but these are obscured with increased size. There is little tendency for the dorsolateral lines to break up into a series of blotches (as in *S. shrevei*), and the lines are almost always entire. Occasional specimens show a tendency toward fragmentation but these are rare. If so, the dorsolateral line fragments are not blotchlike and are recognizable as parts of dorsolateral lines, not independent blotches.

The most distinctive feature of *S. asterulus* is also the most variable in preserved specimens: the tiny white isolated dots in the dorsolateral lines. In our original series of 42 specimens, our color notes state that *all* specimens (23 males with snout-vent lengths between 22 and 29 mm; 18 females with snout-vent lengths between 21 and 30 mm; one hatchling with a snout-vent length of 15 mm) had dots present in the dorsolateral lines. When these (and the remainder of the long series) were studied approximately 4 months later, most of both sexes still showed the white dots or the scales where they had been, but they were less often encountered in males (53%) than in females (86%). Most persistent are the dots on the granular neck scales, with those on the body tending to become obscure or lost. Since preserved *S. leucaster* completely lose their white "stars" promptly after preservative, we can logically as-

sume that the same is true for *S. asterulus* and its dots. A second factor is that the dots in *S. asterulus* tend to be less clear and bold in large specimens. Both these factors, then, would tend to account for the loss of white dots in such a large percentage of *S. asterulus*. (It is interesting that juveniles with snout-vent lengths of 19 mm or less retain spots clearly.) But these factors do not account for the fact that almost half of the male *S. asterulus* (47%) have lost their dots, whereas a much smaller percentage (14%) of the females has done so. We suggest that there is some weak dichromatism in *S. asterulus* with more males than females tending toward an unspotted condition in life, and that by chance our original series had all males with dots.

*Comparisons.* *Sphaerodactylus asterulus* is geographically close to *S. shrevei* (80 km) across the Presqu'île du Nord Ouest and is patterned similarly to *S. leucaster*, from whose range *S. asterulus* is removed from 220 km. From *S. shrevei*, *S. asterulus* differs in having a lined dorsum in contrast to a blotched or cross-banded one. *Sphaerodactylus shrevei* averages higher in all scale counts (dorsals 23.8 versus 21.4 in *S. asterulus*; ventrals 32.2 versus 28.6 in *S. asterulus*; midbody scales 42.0 versus 37.2 in *S. asterulus*), although all counts overlap broadly with least overlap in number of dorsals. The modally 1 internasal in *S. shrevei* differs from the modally 2 internasals in *S. asterulus* (71% versus 60%); 50 of 445 (11%) *S. asterulus* have 1 internasal.

*S. asterulus* and *S. leucaster* are in some ways similar — both have dorsolateral lines with white inclusions — dots in the former case, large radiating white spots in the latter. In *S. leucaster*, the white spots interrupt the dorsolateral lines completely, resulting in irregularly broken dorsolateral lines, whereas this is not the case in *S. asterulus*. *S. asterulus* also has well

developed lateral stripes, which are absent in *S. leucaster*. Scale counts and frequencies are comparable.

From *S. rhabdotus*, *S. asterulus* differs in having dots in the dorsolateral lines, whereas *S. rhabdotus* has neither spots or dots — the lines are entire (see, however, the discussion of *S. rhabdotus* variation in the present paper).

*S. asterulus* has a lower mean in dorsal scales (21.4) and midbody scales (37.2) than either *S. leucaster* (23.5 and 39.8) or *S. rhabdotus* (23.8 and 40.4). On the other hand, *S. asterulus* has a higher ventral mean (28.6) than either *S. leucaster* (27.4) or *S. rhabdotus* (28.0). In all cases the ranges of variation overlap broadly. Two internasals show about the same frequency in all three species (*S. asterulus* 60%, *S. leucaster* 68%, *S. rhabdotus* 63%). Both *S. asterulus* and *S. leucaster* have modes of 10 subdigital lamellae, whereas *S. rhabdotus* has a mode of 9. The modes are weak (37% and 44% in the first two species, 36% in *S. rhabdotus*). Means of fourth toe lamellae vary from 9.5 in *S. leucaster* to 10.2 in *S. asterulus*.

Escutcheon size in males of all three species is peculiar in its extreme variability. In *S. asterulus*, the length varies from 1 to 9 scales, and the width from 6 to 21 scales. The length of the escutcheon in male *S. leucaster* (5-8) and *S. rhabdotus* (5-9) is much less peculiar, but in these two species the width of the escutcheon shows extreme variability, from 8-24 in *S. leucaster* and 7-25 in *S. rhabdotus*. Ontogeny and sexual maturity may be factors in this case.

Members of the *shrevei* complex have only hair-bearing scale organs. In *S. asterulus* the number is extremely variable, with between 6 and 15 organs along the free margin of the scale, each with from 1 (usually) to 2 or 3 "hairs." *S. rhabdotus* has 5 to 11 hair-bearing organs, each with

1 "hair," per scale (Schwartz, 1970:64) and *S. leucaster* has 3 to 8 organs, usually with 2 "hairs" (Schwartz 1973:36).

*Remarks.* We have already mentioned the taking of the original series of *S. asterulus* within the dead basal rosettes of *Agave* and in low rock piles. In the debris in the *Agave* leaves we also encountered many eggs, mostly hatched, but five unhatched. Measurements of four of these vary (in mm) between 6.4-6.8 X 5.1-5.7. The fifth egg hatched in the collecting bag, and the juvenile from it has a snout-vent length of 15 mm. In addition to the large numbers of *S. asterulus* encountered by us, we also secured an adult *Epicrates f. fordi* Gunther and an immature *Phyllodactylus*. The snake was within the punky stem of an *Agave*, whereas the lizard was in a pile of rocks and *Agave* leaves.

## DISCUSSION

The *shrevei* group is composed of four species whose range occupies two general regions: extreme northwestern Haiti and the Valle de Neiba and the Llanos de Azua in the Republica Dominicana. Those authors who have previously dealt with members of the group (Lazell, 1961; Schwartz, 1970, 1973) have been hard pressed to suggest to what other Hispaniolan or even Antillean geckos the *shrevei* group is related. The combination of characteristics of the *shrevei* group set it off from all other *Sphaerodactylus*; the convex snout and vertically elliptical pupils are, in combination, unique. These characters are apparently primitive within *Sphaerodactylus*, and it may well be that the *shrevei* group represents an old remnant of a *Sphaerodactylus* radiation. Its apparently fragmented distribution would tend to confirm this interpretation. It is also possible that the *shrevei* group is derived from the *difficilis* complex, which

is in turn composed of the Hispaniolan members of the *notatus* group. We make this latter suggestion, not for any particular reasons of similarity between the two (although at least keeled dorsal scales is one character in common between them), but only because the *difficilis* complex is the most widespread and most diverse of the Hispaniolan groups and/or complexes of geckos. Although the *difficilis* complex lizards do not totally shun xeric regions, they are not the "typical" geckos occupying xeric areas. Thus the *shrevei* group and the *difficilis* complex are roughly complementary in distributions. One member of the *difficilis* complex, *S. altavelensis* Noble and Hassler, is a xerophile, and it has been taken sympatrically with *S. asterulus*; another member, *S. cryphius* Thomas and Schwartz, was found in the same thatch pile as the type series of *S. rhabdotus*. *Sphaerodactylus ocoae* Schwartz and Thomas also appears to be at least marginally sympatric with *S. leucaster*, and *S. difficilis* Barbour and *S. leucaster* may well be sympatric in portions of the Llanos de Azua. A still-unnamed species of *Sphaerodactylus*, not of the *difficilis* complex, has been taken with *S. asterulus*. Despite the above examples of macrosympatry and even syntopy, but on the other hand taking into consideration the large number of Hispaniolan *Sphaerodactylus* species, we can say as a general statement that members of the *shrevei* group are so confirmedly xerophiles that they are rarely found with other Hispaniolan *Sphaerodactylus*.

It would be most convenient to state that the two northern species (*S. shrevei* and *S. asterulus*) were more closely related to each other than they are to the southern pair (*S. rhabdotus* and *S. leucaster*; see Fig. 1). This seems not to be the case; the lineate pattern of *S. asterulus*, *S. rhabdotus*, and *S. leucaster* would seem to

ally them to each other, despite the wide hiatus between them, rather than the blotched pattern of *S. shrevei* and the dotted pattern of *S. asterulus*. Even more convincing of this relationship are the white dots of *S. asterulus* and the white blotches of *S. leucaster*. In fact, one might with some justification consider *S. asterulus* a subspecies of *S. leucaster* on this basis. But the wide geographical separation of these two taxa, plus the interposition between them of *S. rhabdotus* (which lacks white markings in the dorsolateral lines) suggests that we are dealing with three species. We have commented on the complementarity of the ranges of *S. leucaster* and *S. rhabdotus* and the possibility that perhaps these two taxa might better be regarded as subspecies; certainly the 21 km gap between their known ranges is small. But between them courses the large Río Yaque del Sur, a major river, and *S. leucaster* occupies areas east of the river and *S. rhabdotus* the west.

Williams (1961) noted that the Hispaniolan herpetofauna is divided into two major sections, corresponding to the north and south paleoislands into which modern Hispaniola was divided. This point has been emphasized repeatedly by other authors, and it is a valid one. Although there are exceptions, most of the Hispaniolan herpetofauna can be divided into north and south island elements; the modern division of these two old islands is the Cul de Sac-Valle de Neiba plain, and it is in the latter portion of this (the Valle de Neiba) that *S. rhabdotus* occurs. There is no question that the *shrevei* group as a whole is north island in affinities: three of its species (*S. asterulus*, *S. shrevei*, *S. leucaster*) occur exclusively upon it. But *S. rhabdotus*, originally described from a south island locality, has now been taken on both sides of the Valle de Neiba; two localities (Las Lajas; La Descubierta) are on the

northern side, whereas three others (La Florida; Duvergé; Angostura) are on the south. If we postulate that *S. rhabdotus* and *S. leucaster* were originally inhabitants of the southern xeric shore of the north island, the two species separated by the north island Río Yaque del Sur, then it is probable that, with closure of the interisland strait, *S. rhabdotus* has crossed the Valle de Neiba to reach to the foothills of the Sierra de Baoruco on the south island. Such a scenario presents no major problems and accounts for the occurrence of *S. rhabdotus* away from the north island center of the group.

*S. shrevei* and *S. asterulus* are apparently restricted to northwestern Haitian Presqu'île du Nord Ouest, the former on the peninsula itself, the latter at its southeastern base. Most of this peninsula remains unknown herpetologically, and we have as yet no clear concept of what species occur there or the precise distributions of the species already known. Most of the latter are known from very limited material and from a few scattered localities (or only one locality). What is puzzling are the radical differences in pattern between *S. shrevei* and *S. asterulus* — blotched in the former, lineate in the latter. Thus, *S. asterulus* much more closely resembles in pattern the more distant *S. rhabdotus*-*S. leucaster* pair than it does adjacent *S. shrevei*. This may only mean that *S. shrevei* has been isolated for a much longer period from the basal, lineate *shrevei* group stock than has *S. asterulus*. Until more material of both species is known from this region, it is futile to speculate further. We should also like to point out that the road between the main road near Les Poteaux and the northern coast at Port-de-Paix passes through xeric country for much of its 77 km; only toward its northern coastal section near Port-de-Paix may the area be called mesic. Yet we had no success in

securing *shrevei*-group geckos along this road. We did encounter *S. difficilis* at several xeric localities, which suggests that no *shrevei*-group member occurs here. But since *shrevei* group sphaerodactyls occur in very rigorous situations and may not be common, our not securing any in this region may not be so significant.

The 130 km hiatus between *S. asterulus* and *S. rhabdotus* may be more apparent than real. *Sphaerodactylus rhabdotus* is still known from the Haitian Cul de Sac plain, although it occurs very near the border (Las Lajas). We confidently expect it in this valley. From the western end of the Cul de Sac, xeric coastal areas follow the shore of the Golfe de la Gonâve to near St. Marc. Just north of that city lies the wide (30 km) Vallée de l'Artibonite, presently irrigated and flooded for the cultivation of rice. Inland, however, the Vallée de l'Artibonite is xeric and could supply suitable habitat for a *shrevei* group member. North of the valley and southeast of the city of Gonâives, there are once more extensive xeric areas which are continuous with the region where *S. asterulus* occurs. It would seem likely that *S. rhabdotus* occurs from the República Dominicana into the Cul de Sac plain and thence along the shore to the southern edge of the Vallée de l'Artibonite and that *S. asterulus* occurs as far south as the northern edge of this same valley. But efforts on our part and those of others to secure members of this group in this region have failed totally. In fact, the sphaerodactyl fauna of this region is poorly known. As in all desert regions, native cooperation is hard to encourage, and collecting on the part of the investigator is more than likely to reveal nothing for lack of suitable places to search. Certainly this entire region is one which deserves special attention as far as its *Sphaerodactylus* fauna is concerned.

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(ANSP), and the Museum of Natural History, University of Kansas (KU). We have also examined specimens in the collection of Richard Thomas (RT). Some specimens of *S. rhabdotus* and *S. leucaster* were collected under the auspices of National Science Foundation grants G-7977 and B-023603 to the senior author. We are especially grateful to Fred G. Thompson and Ronald I. Crombie for keeping us abreast of their activities in the República Dominicana and for allowing the senior author to examine material promptly after it had been collected. The illustrations of the four *shrevei* group species are the work of Beryl Bayer to whom we are grateful.

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